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(71) Applicant: DRESSER-RAND COMPANY
Baron Steuben Place
Corning New York 14830(US)

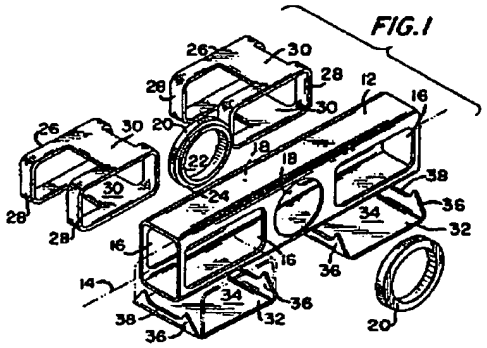
(72) Inventor: Bennitt, Robert A.
24 Seneca Trace
Painted Post, New York 14870(US)

(74) Representative: Holdcroft, James Gerald, Dr. et al
Graham Watt & Co., Riverhead
Sevenoaks, Kent TN13 2BN(GB)

(54) Reciprocating-piston machine.

(57) A housing (12), feet (34) therefor, and casings (26), formed of common, readily available tubular stock, of uniform thickness, are assembled and welded together to define a frame for a crankshaft and crosshead assemblies. The tubular housing has openings (16) in the sides thereof in which to receive the casings, and has apertures (18), also in sides thereof, in which to journal a crankshaft. The casings include transverse webs (30), with arcuate ways formed therein for slidably supporting crosshead shoes thereon. Also disclosed is a frame, crosshead and crankshaft assembly for a reciprocating-piston machine based on the aforedescribed frame.

FIG. 1



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This invention pertains to reciprocating-piston machines, such as gas compressors, and the like, and in particular to a frame, crankshaft and crosshead assembly, and to a crankshaft and crosshead frame for such machines.

Frames, crankshafts and crosshead arrangements for reciprocating-piston machines typically involve expensive castings and machining of components and parts, and yield ponderous end products.

It is an object of this invention to provide (a) a frame, crankshaft and crosshead assembly, and (b) a crankshaft and crosshead frame, for a reciprocating-piston machine, which entail minimal cost, ease of manufacturing, have simplified lubrication, and constitute low-weight end products, albeit of sturdy and reliable construction.

According to the present invention there is provided a crankshaft and crosshead frame for a reciprocating-piston machine, comprising a tubular housing having openings in which casings having webs are fixed for slidably supporting crossheads, and wherein the casings for example comprise substantially rectangular frameworks which are fixed in spaced-apart parallelism by said webs.

Also provided is a frame, crankshaft and crosshead assembly for a reciprocating-piston machine, comprising a crankshaft and crosshead frame according to the invention wherein a crankshaft is journalled in the apertures in the tubular housing and a crosshead assembly is coupled to the crankshaft.

The frame housing may have openings formed therein on opposite sides of a longitudinal axis, and casings fixed in said openings, wherein said casings have webs which may have arcuate ways formed therein for slidably supporting crossheads thereupon.

There now follows a description of an embodiment of the invention, to be read with reference to the accompanying drawings. The description is given by way of example of the invention and not by way of limitation thereof:

FIG. 1 is an exploded view, in perspective of the novel frame, according to an embodiment thereof;

FIG. 2 is a perspective illustration of the assembled frame of FIG. 1;

FIG. 3 is a cross-sectional view of the frame of FIG. 2, the same taken along the horizontal plane of the longitudinal axis thereof;

FIG. 4 is an enlarged view of the cross-sectioned frame of FIG. 3, showing, however, the crankshaft and crosshead assembly in place, according to the invention; and

FIG. 5 is an illustration in the same scale as FIG. 4, showing the crankshaft and crosshead assembly also cross-sectioned, to depict the lubrication arrangement, and having a lubrication pump and drive assembly represented therein and exploded from the drive connection therefor in the crankshaft.

As shown in FIG. 1, the novel frame 10 comprises a tubular housing 12 of substantially rectangular cross-section, which has a longitudinal axis 14 and openings 16 formed therein on opposite sides of the axis 14, as well as apertures 18 on opposite sides of said axis 14 and intermediate the openings 16. The apertures 18 receive therein annuli 20 which have annular lips 22 and circular lands 24. The lips 22 are nestedly received in the apertures, and the lands 24 set against the outer peripheries of the apertures 18.

Casings 26, also of substantially rectangular cross-section, are received in the openings 16. The casings 26 comprise substantially rectangular frameworks 28 which are fixed in spaced-apart parallelism by integral webs 30. The casings 26 are set into the openings 16 with the innermost edges, i.e. the mutually confronting edges, of the frameworks 28 resting in the openings 16, and the rest of the frameworks 28 extending outwardly from the openings 16. Consequently, the webs 30 bridge across the interior of the housing 12 (Figure 2).

The housing 12 and the casings 26 are inexpensively fabricated from common, tubular stock of uniform thickness. Upon the casings 26 being set into the openings 16, they are welded in place.

To support the housing 12 on the axis 14, a pair of feet 32 are provided. The latter have flat bases 34 and right-angularly-extending ledges 36, with reliefs 38 formed therein in which to receive the housings 12. The feet 32, too, are welded in place. The feet 32, as shown in FIG. 1, are also formable from such same, common, tubular stock of uniform thickness.

As just described, the frame 10 is assembled, with the annuli 20 being welded in place, in the apertures 18. Thereafter, the annuli 20 are bored and tapped, about the outermost facing thereof, to receive fasteners with which to secure bearing housings thereto. The outermost edges of the frameworks 28 are also bored and tapped to receive covers (not shown in FIG. 1) thereat. Too, the bases 34 of the feet 32 are bolt-holed to accommodate mounting bolts. Also, the webs 30 each have an arcuate way 40 formed therein, longitudinally parallel with the axis 14.

The assembled frame 10 is shown in FIG. 2; FIG. 3 shows the assembled frame 10 cross-sectioned along the horizontal plane of the axis 14.

FIG. 4 shows the frame 10, as depicted in FIG. 3, albeit in greater scale, and with the crankshaft and crosshead assembly in place therein. The crankshaft 42 has counterweights 44 integral therewith, and the counterweights 44 are journalled in

the annuli 20, in that the counterweights each have a given, greatest diameter "D" defined by a common radius "r". Each counterweight 44 has a weighting lobe 44a which is within the diameter "D". Bearings 46, captive in bearing housings 48, also journal the crankshaft 42, the housings 48 being fastened to the annuli 20.

Crosshead/connecting rod subassemblies 50 are coupled to throws 52 (FIG. 5), and comprise upper and lower shoes 54 with arcuate bearing surfaces 56. The latter, the bearing surfaces 56, are slidably received by the ways 40. Lubrication for the frame, crankshaft and subassemblies 50, is depicted in FIG. 5. An end of the crankshaft 42 has a rectilinear relief 58 formed therein to receive the rectilinear end of an oil pump shaft 60. The end of the shaft 60 is set into the relief 58, and the oil pump 62 and cover 64 are nested in, and fastened in, respectively, the bearing housing 48 thereat. The crankshaft 42 has lubrication passageways 66 formed therewithin, for communication with the pump 62 and conduct of lubricant to the bearings 46 and the subassemblies 50. Too, the latter subassemblies have similar passageways 68 formed therein, and the shoes 54 have further passageways 70 formed therein for conducting lubricant to the bearing surfaces 56. As shown (FIG. 5) covers 72 are fastened to the frameworks 28.

The embodiment of the invention comprehends an inexpensive construction, particularly through the use of common, readily available, tubular stock of uniform thickness. It is simplified as to construction and maintenance, and is of light weight. Too, as is evident from the foregoing, machining for the invention is quite minimal.

Claims

1. A crankshaft and crosshead frame for a reciprocating-piston machine, comprising a tubular housing having openings in which casings having webs are fixed for slidably supporting crossheads, and wherein the casings for example comprise substantially rectangular frameworks which are fixed in spaced-apart parallelism by said webs.

2. A frame according to claim 1 wherein the openings in the housing are formed on opposite sides of a longitudinal axis of the housing and the webs in the casings have arcuate ways formed therein for slidably supporting the crossheads, the ways for example extending longitudinally, on opposite sides of, and parallel with, said axis.

3. A frame according to claim 2 wherein the ways extend longitudinally on opposite sides of, and parallel with, the longitudinal axis.

4. A frame according to any of the preceding claims wherein the casings and housing are all formed from common tubular stock of uniform thickness, said frame for example further comprising means fixed to said housing for supporting the housing along the longitudinal axis.

5. A frame according to any one of the preceding claims wherein the housing has apertures, located for example intermediate said openings, for journalling a crankshaft therewithin, which apertures may for example have annuli fixed therein.

6. A frame, crankshaft and crosshead assembly for a reciprocating-piston machine, comprising a crankshaft and crosshead frame according to claim 5 wherein a crankshaft is journalled in the apertures in the tubular housing and a crosshead subassembly is coupled to the crankshaft and slidably supported on the webs of the casings, the subassembly for example having crossheads with arcuate shoes for engagement with arcuate ways in the webs.

7. An assembly according to claim 6 wherein the crankshaft has integral counterweights each with a given, greatest diameter defined by a common radius, which counterweights may for example be journalled in the annuli in the apertures.

8. An assembly according to claim 7 further comprising bearings located in bearing housings that are fastened to said annuli and wherein opposite ends of said crankshaft are set within the bearings.

9. An assembly according to any one of claims 6 to 8 wherein the crankshaft has a plurality of throws and the subassembly has a plurality of connecting rods, each rod being connected to one of the throws.

10. An assembly according to any one of claims 6 to 9 wherein the subassembly has lubrication passageways formed wholly therewithin and wherein for example an end of said crankshaft has a relief formed therein for drivingly receiving a shaft of an oil pump therewithin, and said crankshaft has lubrication passageways formed wholly therewithin for communication with the oil pump, upon such being shaft-driven by said crankshaft relief, and said communication with said passageways formed within said subassembly.

FIG. 1

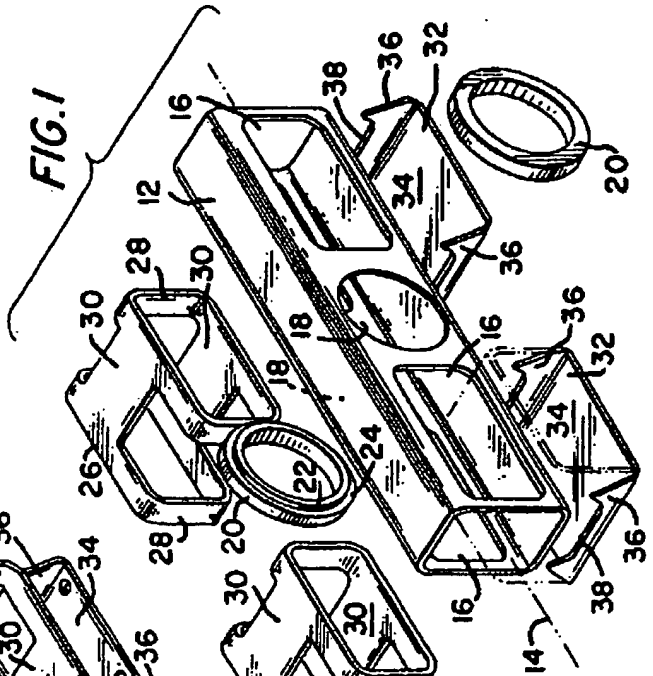


FIG. 3

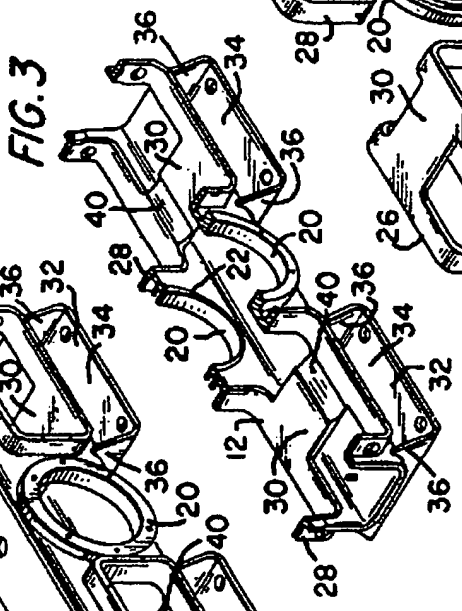
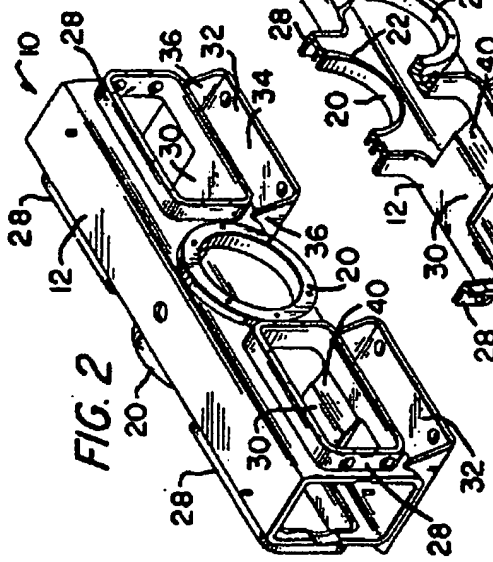


FIG. 2



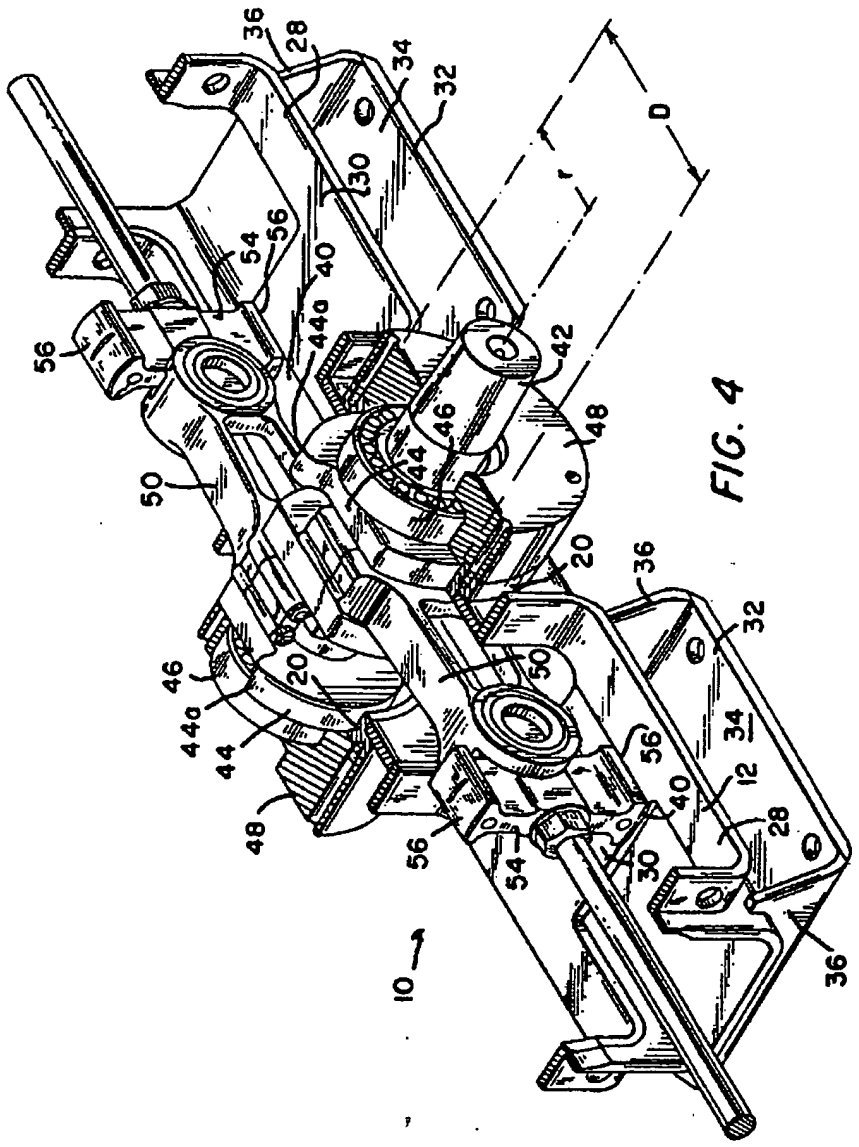


FIG. 4

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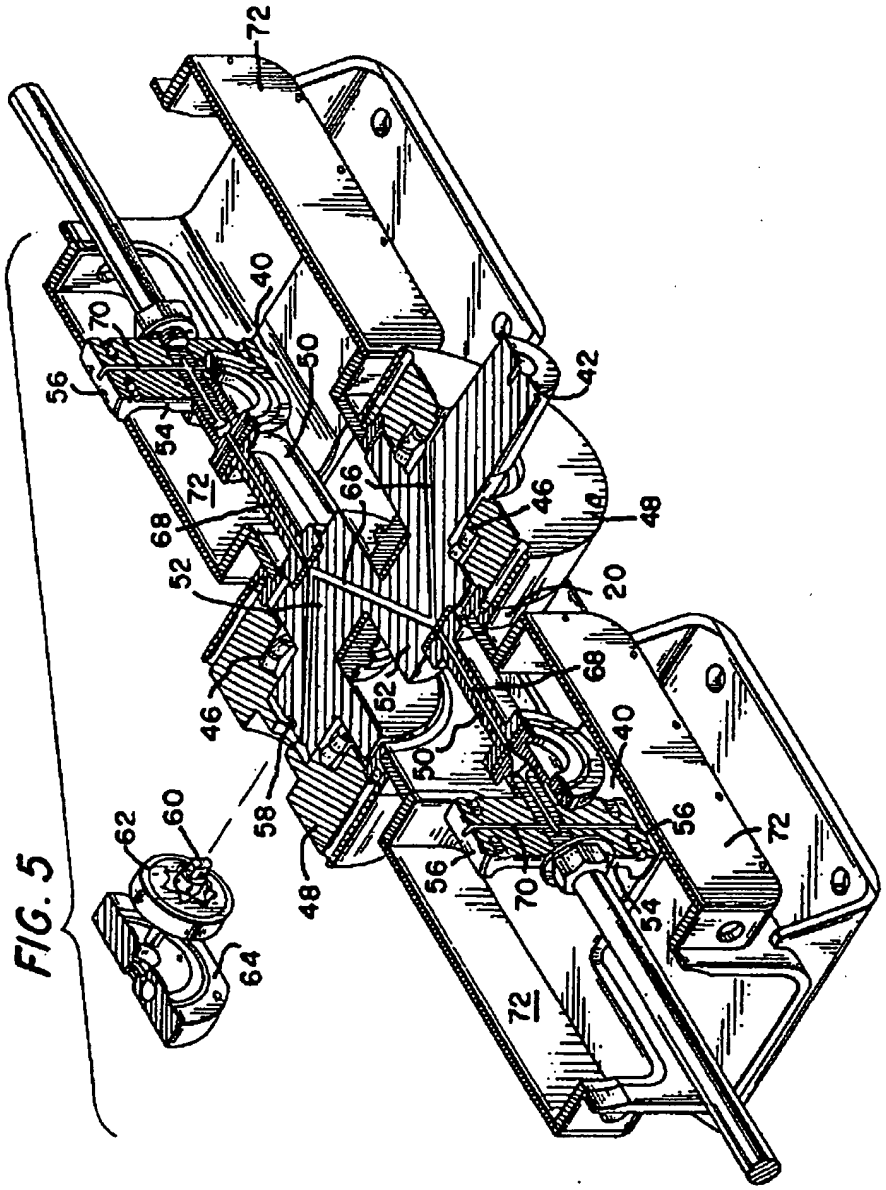

FIG. 5